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ABSTRACT

The purpose of this paper is to elucidate processes involved in the sibling relationship in terms of four dimensions that are focal in the literature: imitation, dominance, agonism (negative behavior directed towards a sibling), and prosocial behavior. A number of findings on these dimensions were culled from 24 studies, 18 of which were done after 1980. A summary table that orders sample characteristics, research procedures, study variables, and level of significance, was constructed. Quantitative analyses were run when five or more findings in an area could be collected from an examination of each table of data in the collection of studies. Rosenthal's (1984) formula for effect size and a test of significance of effect were used. When two to four findings were found, results were evaluated qualitatively. Findings indicated that, within the areas of imitation, dominance, agonism, and prosocial behavior, generalizations clearly exist for which a good deal of evidence can be found. For example, the analysis yielded clear evidence that the older sibling plays an important role in the sibling relationship. Preschool mixed-sex dyads increase in agonism over time. Spacing of siblings' births is a significant variable. Dominance is greater in wide-spaced mixed-sex dyads. Males display more agonism with their siblings, while females display more prosocial behavior with their siblings. (RH)

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Imitation, Dominance, Agonism and Prosocial Behavior: A Meta-Analysis of Sibling Behavior

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Running head: SIBLING META-ANALYSIS

Paper presented at the biennial meeting of the Society for Research in Child Development, April 25, 1987.

Imitation, Dominance, Agonism and Prosocial Behavior: A Meta-Analysis of Sibling Behavior

Traditional psychoanalytic thought has characterized the sibling relationship almost exclusively in terms of sibling rivalry, and this influence has been profoundly felt in much of the literature. The sibling relationship, however, is a complex and multifaceted one, as more recent research is just beginning to uncover. Lamb (1982), in discussing the profound role siblings play in each other's lives, stated:

> Siblings set and maintain standards, provide models to emulate and advice to consider, enact complementary roles in relation to one another through which both develop and practice social-interactional skills, and serve as confidantes and sources of nonjudgemental social support in times of emotional stress. (p. 6)

Thus, the sibling relationship cannot be boiled down to a description of two individuals engaged in a powerful struggle for parental affection. While elements of rivalry may be seen in the issue of dominance in the sibling dyad, other processes such as imitation and prosocial behavior must be considered.

Lamb (1982) has described a current shift in the focus on the research from the study of effects to the study of processes. Formerly, most of the research was correlational in nature. Large groups of people (generally high school or college students) were tested on some standardized measure of psychological or cognitive functioning, and any differences among the groups were attributed to sibling status. The problem with this approach was that the researcher could only speculate about possible causes of such differences (birth order being most commonly attributed). More recent research has focused on observational analyses and has been descriptive and process-oriented. This has

allowed contemporary researchers an increased ability to determine the processes whereby effects are mediated.

Over the past two decades, enough research has been accrued that it should be possible to characterize the nature of the sibling relationship in some aspects. Thus, the processes involved in the sibling relationship can be elucidated and a starting place for further research can be established. This is the purpose of this paper. More specifically, the research related to four dimensions of the sibling relationship will be analyzed: imitation, dominance, agonism, and prosocial behavior. While these four factors cannot be considered to furnish an all-inclusive description of the sibling relationship, they do represent the focus of the literature.

Imitation will be defined for the purposes of this analysis to be the performance of the same behavior as the sibling. This may include talking, behavior such as running, taking the toy abandoned by the other sibling, etc. For older groups where direct imitation is less likely to occur (i.e., age 12 and older), the definition of imitation will be expanded to include similarity or perceived similarity between the siblings. An example of this would be similarity of interests shared by two siblings.

Dominance refers to the relative amount of power held or perceived to be held by each sibling. The more dominant sibling usually directs the action while the less dominant follows along and is directed. The key question in dominance is, "Who's in charge?"

Agonism is negative behavior directed toward the sibling. It includes physical aggression, object struggles, rivalry, competition, cheating,

hostility, and refusal to help or share. It also includes verbal behaviors such as insults, disapproval, threats, tattling, and quarreling.

Prosocial behavior is positive behavior directed toward the sibling. It includes helping, sharing, comforting, praising, affection, friendly approaches, perceived intimacy, companionship, cooperative play, caregiving, etc. This category also includes positive behavior resulting from sibling interaction (such as increased endurance in a task situation).

A number of findings in these areas were culled from 24 studies, and these findings were analyzed for significance. A discussion of this procedure follows.

Procedure

Sources

A manual search for articles related to sibling interaction was conducted using the Psychological Abstracts and Child Development Abstracts for the years 1960-1987. The reference sections of all articles were scanned for other relevant articles. Articles on birth order and cognitive or intellectual functioning were eliminated, as were articles dealing with ordinal differences in parent-child relationships. Articles dealing with non-normal populations such as handicapped or chronically ill siblings were also omitted from this analysis.

Evaluation of Sources

The majority of studies (11) were home observations of sibling dyads. Five studies were laboratory observations. Eight studies involved the administration of a test (2), questionnaire (3), or an open-ended interview (3).

One study involved an experimental design. The majority (17) of the studies in this area involve observation of sibling dyads as the methodology of choice.

Because the emphasis on processes is a recent phenomenon in the literature, this analysis relied heavily on current studies. Of the 24 studies analyzed, 18 are from the last 7 years. However, it was felt that a more complete picture could be obtained through use of the older correlational studies when they were appropriate, and the literature surveyed covers the period from 1968 through 1985.

The sample size of the observational studies ranged from 22 sibling pairs to 73 sibling pairs, with a median of 42 pairs per study. The correlational studies tend to be much larger in terms of sample size, ranging from 95 subjects to 1,890 subjects. Data analysis is easier in the latter type of study, which explains the larger sample sizes used in these studies. It is also true that statistical significance is easier to obtain in these studies because of the larger sample size, a fact that was taken into account in the computation of the meta-analysis. The larger samples yield smaller effect sizes and correspondingly, the size of the mean $\underline{r}$ is affected.

The age of the subjects of these studies range from birth to college age. Eight studies focused on infant-preschool sibling relationships, five on relationship of preschool-aged siblings, eight on relationships of preschoolers and their school-aged siblings, and four on adolescents. Thus, a good sample of studies at each developmental level from birth through adolescence was obtained.

Reliability as assessed by interobserver agreement at the 70% level or above was reported in all of the observational studies. Instrument reliability was not discussed for any of the correlational studies.

Perhaps the greatest threats to validity in these studies are instrumentation, selection, and interaction. Fatigue can always be a factor in observation, and this may be a source of one kind of instrumentation error. Additionally, it is possible that more variety exists in sibling interaction than is currently being measured, and that qualitative differences exist within the same type of interaction. (For example, prosocial behavior may be thinly masked agonism, as with the child who hugs her sibling so tight as to hurt her. This would be scored as prosocial behavior, but clearly more is involved.)

Selection is also a potential problem in these studies. Where sample characteristics are given, children tend to be Caucasian and middle class. Generally, sample statistics are not given, implying that available samples were used. The question of whether sibling relationships differ across ethnic group or social class simply has not been addressed, and the children in these studies are all British, American, or Canadian. Thus, our picture of sibling relationships remains incomplete at best.

Finally, interaction may be a possible threat to validity. The observation itself may potentially change the sibling relationship. For example, Corter, Abramovitch, and Pepler (1983) noted a trend for greater agonism in mother's presence than in her absence, and some gender and spacing interactions within this trend. It is possible that the presence of an observer might have a similar effect, and that this might affect different gender-spacing combinations differently. This could be mistaken for significant differences which are in reality artifactual.

Cumulation of Findings

A summary table of the 21 studies was completed (see Appendix A). This table included sample characteristics, the procedures used, variables in the study, and level of significance. The studies have been arranged in reverse chronological and alphabetical order.

Following this cumulation of findings, each table was examined for results which had been obtained in more than one study. All results which had been obtained more than once were considered, and analyses were run when five or more findings in an area could be derived. The tables which resulted from this analysis may be found after Appendix A. Where two to four findings were derived, these results will be evaluated qualitatively in the text of the paper.

In this analysis, and because of the way the definitions were constructed, more than one finding may have come from a single study. This is because it was possible for a study to find, for example, both verbal and physical imitation occurring within an observation. In such a case, both findings would have been utilized as part of the meta-analysis, using their separate significance levels and degrees of freedom, where differences existed.

Analysis of Findings

The most widely taught and used technique of meta-analysis is that of Hunter, Schmidt, and Jackson (1982), which employs estimates of *d*, given by the formula:

$$d = \frac{X_E - X_C}{SD_C}$$

where *d* is effect size, X_E is the mean of the experimental group, X_C is the mean of the control group, and SD_C is the standard deviation of the control group.

This approach was clearly unworkable for the purposes of this study, since in most cases both siblings were observed interacting, and assignment of "experimental" and control" labels would have been arbitrary at best. Also, it was found that reporting of standard deviations in the literature in this area tends to be spotty. Thus, an alternate technique was sought and found in Rosenthal's (1984) procedures. Rosenthal's effect size, r, can be computed from the probability level associated with the finding and the sample size or degrees of freedom. The effect size, r, is calculated from the formula:

$$r = \frac{Z}{\sqrt{N}}$$

Where Z is the value corresponding to the p given as level of significance associated with the finding, and N is the sample size (or degrees of freedom may be used).

It was often necessary to estimate degrees of freedom in this study. Where degrees of freedom are estimated, a question mark is used to note this. For analysis of variance, degrees of freedom were estimated using the formula J(N-1), where J = the number of groups. For the Mann-Whitney U test, degrees of freedom were df = n + m, or the number in the first group plus the number in the second group. For t-tests, the degrees of freedom for correlated samples is number of pairs minus one and otherwise is sample size minus two. For the median test, N = A + B, where A is the number of scores above the median and B represents the scores below the median.

The tables upon which the final analysis was run are set up as follows: The study number from Appendix A and the test statistic and degrees of freedom

are listed or estimated. The *p* value associated with the level of significance is given in full. The *Z* column contains the *Z* value which corresponds to the *p* value as listed in Table A1 in Conover (1980). The final column contains the *e* computed from *Z* divided by the square root of the degrees of freedom. Mean *p*s, *Z*s, and *r*s were computed for each table by summing each column and dividing that column by the number of findings. The means are located under their respective columns.

It should be noted that p values which support a finding are less than .50, while p values that do not support a finding are always greater than .50. Thus, if a study that was significant at the $p < .05$ level supported the finding, the *p* value is .05, but if it failed to support the finding, the *p* value is 1 - .05, or .95. Both the *Z* and *r* values associated with a *p* value greater than .50 are considered to be negative, although they are determined in exactly the same manner as positive values. A finding of no significance is assigned a *p* value of .50 and a corresponding *Z* and *r* of 0.00.

Where more than four findings were present, a test of mean *p* was utilized to test for significance of effect. The test of mean *p* is relatively simple, using the formula:

$$Z = (.50 - p)\ (\sqrt{12N})$$

where *p* is the mean *p* of the studies and *N* represents the number of findings. The *Z* obtained from the computation was located in Table A1 in Conover (1980) and the corresponding p-value is given in each table. This p-value represents the significance of the advantage *p* obtained from the findings of the studies. This value should be considered with the mean *r* given for the same findings, since this *r* can be squared to give a rough approximation of the amount of

variance accounted for by the finding. Thus, a significant p may be associated with an r that accounts for either a great deal of the variance or very little of the variance. It is, therefore, clear that the p and r values should be considered together.

Results

The results in the area of imitation may be found in Tables 1 and 2. The younger child is more likely to imitate the older ($p < .0001$, $r = .430$). There is less imitation in mixed sex dyads, or greater imitation in same-sex dyads ($p < .0005$, $r = .171$).

Insert Tables 1 and 2 about here

Three findings were tested in the area of dominance, as may be found in Tables 3 through 5. The older child acts as manager

Insert Tables 3 through 5 about here

while the younger takes the role of managee, $p < .0001$, $r = .360$. The older child takes the role of teacher more often while the younger takes the part of learner, $p < .0001$, $r - .369$. Older siblings are more dominant, or are perceived as such by their younger siblings, $p < .0001$, $r = .294$.

In addition, three studies (Furman & Buhrmester, 1985; Minnett, Vandell, & Santrock, 1983; Stewart, 1983a) found support for the notion that dominance of the older sibling is greater with widely spaced (more than three years) siblings, with all three studies supporting this finding at the .05 level or

beyond. A finding that the older, same-sex sibling is more dominant was supported in two studies (Furman & Buhrmester, 1985; Minnett, Vandell, & Santrock, 1983) but discomfirmed by Bigner (1974). Older siblings in mixed-sex, widely spaced pairs tend to be more dominant according to the findings of both Furman & Buhmester (1985) and Bigner (1974).

Agonism was an area where several findings of significance were obtained, which may be examined in Tables 6 through 9. Chief among these findings is that the older sibling initiated more agonism, $p < .001$, $r = .398$. Agonism is greater when siblings are closely spaced ,$p < .0055$, but this finding accounts for a lesser amount of variance, $r = .10$. Along the same lines, the finding

Insert Tables 6 through 9 about here

that males are more agonistic in the sibling relationship was significant at the .008 level, but was associated with the relatively small r of .111. However, there is more agonism in same-sex dyads, $p < .0005$, $r = .232$. Both Dunn and Kendrick (1982) and Pepler, Abramovitch, and Corter (1981) found that agonism significantly increases over time in preschool mixed sex dyads.

The findings for prosocial behavior are located in Tables 10 through 13. Girls are more prosocial in their dealings with their siblings, $p < .0001$, $r = .308$. More prosocial behavior also occurs in widely spaced sibling dyads, $p < .0001$, $r = .277$. A finding of more prosocial behavior in same-sex sibling dyads was significant, $p < .0005$, but accounted for an extremely small amount of variance, $r = .084$. It was clear, however, that older siblings initiated more prosocial behavior, $p < .0001$, $r = .335$.

Insert Tables 10 through 13 about here

Finally, Stewart and Martin (1984) and Stewart (1983a) found that female siblings were a more likely target of prosocial behavior. Furman and Buhrmester (1985) found more prosocial behavior occurs with closely spaced siblings for both warmth and companionship, but found nurturance to be least when the sibling is a wide-spaced younger sibling.

Discussion

This analysis yields clear evidence that the older sibling plays an important role in the sibling relationship. Older siblings are more likely to be imitated, are more dominant, and initiate more agonistic and prosocial behavior. They serve as teachers and managers. In general, older siblings seem to play an initiating and directive role, and their younger siblings look to them as role models. Lamb (1978b) pointed out that siblings may be more likely to imitate each other because they are more similar in terms of cognitive level. The result of this analysis shows this to be true for younger children, but older children seem to be looking toward another source (in all likelihood, their parents) for role models. At any rate, it is clear that the older child appears to be dominant within the sibling relationship. This is likely to be due to the greater competence of the older child that is a natural outgrowth of maturation. Younger children, who are less competent and less likely to be good sources of information, are not likely to be imitated by the older sibling; nor is the older sibling likely to allow the younger to direct the activity when the older is more capable.

The gender composition of the dyad is also an important factor in the quality of the relationship between the siblings. There is more imitation and agonism in same-sex dyads. (There is also more prosocial behavior, but this finding accounts for so little variance as to render it statistically significant but meaningless.) The combination of increased imitation and agonism for same-sex dyads is an interesting one. It would appear that these siblings want to be like one another but in doing so are more likely to encroach on each other's "turf." The traditional sibling rivalry described by Freud may be more characteristic of same-sex dyads than of mixed-sex dyads, as same-sex dyads seek to accomplish the same goals and see each other as competitors to a greater degree. It is interesting to note that Schacter et al. (1976) suggests that these siblings view each other as being more different that do opposite-sex pairs (they deidentify to a greater degree, in Schacter's terms) as a mechanism for resolving this rivalry.

It is true that preschool mixed-sex dyads increase in agonism over time. However, whether these dyads ultimately remain at a lower level of agonism than same-sex dyads is unknown. This would appear to be the case, since the studies of older children found same-sex dyads to be higher in agonism.

The spacing between children is a significant variable in the sibling relationship. Parents often attempt to plan the births of their children so as to optimize the amount of emotional closeness their children feel to one another. Thus, the information provided by this analysis has value for both practical and theoretical purposes. Older siblings in widely-spaced dyads tend to be more dominant, as might be expected since the older child is more likely to be more competent and physically stronger. Agonism is greater in closely-

spaced dyads; conversely, prosocial behavior is greater with wide spacing between siblings. (Perhaps prosocial behavior is a protective mechanism in widely-spaced dyads due to the greater dominance of the older child.) It appears that parents who want their children to be more prosocial in their behavior toward each other would be wise to space their children at least three years apart. Parents who have closely-spaced children should be prepared for more agonistic behavior.

There was only one interaction between gender and spacing in the literature: The findings that dominance is greater in wide-spaced mixed-sex dyads. This finding has not been investigated widely enough to allow for statistical analysis; nevertheless, given that other studies in the area should have found this interaction if it were a robust phenomenon, it is likely that the sex by gender interaction is not a critical factor in the areas of imitation, dominance, agonism, or prosocial behavior.

In keeping with the literature on sex-role development (Huston, 1983), males display more agonism with their siblings while females display more prosocial behavior with their siblings. While this is probably part of a larger pattern originating in other socialization forces (and possibly some genetic influences), it is clear that these types of behaviors also characterize the sibling relationship. What is interesting is how younger female siblings are significantly more likely to be a target of prosocial behaviors. It is possible that the increased positive affect these children experience may contribute to the gender differences in prosocial behavior between male and female children. Why female children receive more prosocial behavior in the first place is unclear since parental behaviors are far from consistent in this area. Parents

do treat their male and female children differently, but these differences do not clearly lend themselves to an explanation of why an older sibling would behave more prosocially with a younger sister than with a younger brother.

These findings suggest fruitful topics for future research. It is especially important for further research to be conducted in the areas where there are not enough findings to allow meta-analysis to be considered, but even findings which may appear clear-cut should not discourage replication. Replication in the social sciences is important in order to assure that there is validity in the finding, and the finding is not artifactual (Campbell & Jackson, 1979).

Conclusion

Gene Glass (1976) has stated that in the social sciences, we know much less than we have proven. This has been true in the research concerning sibling relationships. There are clearly generalizations within the areas of imitation, dominance, agonism, and prosocial behavior for which a good deal of evidence exists. This meta-analysis has sought to clarify the nature of these generalizations, and in doing so, to increase our knowledge of the sibling relationship.

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Author and Year	Age	Sex	N	Procedure	Findings	Significance
1) Abramovitch, Corter, Pepler & Stanhope (1986)	younger about 5 yr. older 6-9 yr.	24 same sex 24 mixed sex	48 dyads	One hour home observation	Imitation younger more imitation than older Increase over time mixed sex dyads	NA F(1,40)=11.20 p<.01
					Dominance Older sibs initiated more play Established rules	 F(1,40)=9.21 p<.01 89% older 25% younger
					Agonism Older initiated more agonism Younger same sex, older in mixed sex dyads increased over time	 F(1,40)=16.21 p<.001 F(2,29)=4.75 p<.05
					Prosocial Older more prosocial than younger, and this increases over time Same-sex more prosocial than mixed-sex	 F(1,40)=11.71 p<.001 F(2,39)=72.39 p<.001 F(1,40)=5.21 p<.05
2) Dunn & Munn (1986)	second born 18 & 24 m.	9 ff 8 mm 13 fm 13 mf	43 sib pairs	2 one-hour observations at each age	Prosocial Sharing/helping/comforting shown significantly more often by older	t(47?)=?, p<.05
3) Teti, Bond, & Gibbs (1986)	Sibs $\bar{X}$= 4 yrs Infants $\bar{X}$=12 months	19 m-m 13 f-f 20 m-f 17 f-m	69 infant pairs		Prosocial More interest & involvement of older w/younger if widely spaced, as evidenced by less parallell play, more social games more gross motor games	 F(1,52)=2.55 p<.05 F(9,50)=5.97 p<.001 Bonferroni, p<.01 p<.01 p<.01
4) Berndt & Bulleit (1985)	36-64 months	17 m 17 f	34 child	1 hour home observation (compared w/ one hour preschool observation)	Imitation Children W/ an opposite sex sibling displayed less imitation Older less imitation Dominance Younger more often complied with sibling's orders & suggestions	 F(11,22)=2.55 p<.05 F(11,22)=2.41 p<.05 F(11,22)=2.59 p<.0001

					(Also more often noncomply)	p<.10	
					Older gives more orders & suggestions	p<.10	
					Prosocial		
					Younger received more prosocial	F(11,22)=2.59	p<.01
					Agonism		
					Younger received more aggressive	p<.01	
5) Brody, Stoneman, MacKinnon, & MacKinnon (1985)	7-9 & 4.5-6.5 4.5-6.5 2.5-4.5	18 male sibling pairs 18 female sibling pairs	36 dyads	Home observation 30 min.	Imitation		
					Younger as observer	F(1,60)=4.34	p<.04
					Dominance		
					Older as manager	F(1,60)=7.57	p<.008
					Younger as manager	F(1,60)=11.26	p<.001
					Older female schoolaged teacher	F(1,60)=3.85	p<.05
					Younger female schoolaged learner	F(1,60)=5.37	p<.02
					Prosocial		
					Schoolaged female sibs more	F(1,60)=5.32	p<.02
					Older as helper	F(1,60)=3.48	p<.07
					Younger as helpee	F(1,60)=3.69	p<.06
6) Montemayor & Hanson (1985)	$\bar{X}$=15.2	34 f 30 m	64 families	3-40 min phone interviews	Agonism		
					Teens more agruments w/ same-sex sibs than opposit sex sibs		
					males	$\chi^2(3)=9.95$	p<.05
					females	$\chi^2(3)=6.56$	p<.10
7) Benin, & Johnson (1984)	>21	not given	1,890 respondents	Parent interviews	Imitation		
					Like sex pairs more similar in educational attainment than cross-sex pairs	LISREL estimates using residual covariance p<.05	
					Similarity in attainment greatest for smaller age differences, especially in same sex dyads	p<.05	
8)Stewart and Marvin (1984)	Siblings $\bar{X}$=50.6 infants 17m.	15 m-m 14 f-m 13 f-f 13 m-f	57 mother-sib-baby dyads	Lab observation Strange situation	Prosocial		
					Caretaking of younger	51%	
					Female more likely target of caregiving	$\chi^2(1)=3.99$	p<.045
9)Stoneman, Brody	8-10 yrs	11 male	22 same sex	3 home	Dominance		

& MacKinnon (1984)	4.5-7 Yrs	11 female sibling pairs		observations 30 min. each	Older as manager	F(1,40)=7.33	p<.01
					Older as teacher	F(1,40)=6.23	p<.02
					Younger acceptance as managee role	F(3,26)=6.73	p<.01
					Prosocial		
					Girls parallel or coperative play more often than boys	F(1,40)=3.75	p<.05
10)Furman & Buhrmester (1985)	11-13 yrs	20 males 29 females	49 children	Open ended interview	Prosocial		
					Companionship (93%)	No test of significance	
					Admiration (81%)		
					Prosocial (77%)		
					Affection (65%)		
					Agonistic		
					Antagonism (91%)		
					Quarreling (79%)		
	5th & 6th grades	95 males 103 females	198 children	Administration of questionaire	Imitation		
					Similarity greater with same-sex sib	F(1,148)=10.57	p<.05
					Dominance		
					Greater influence over younger sibs	F(1,148)=418.51	p<.05
					Agonism		
					Greater with close spacing,		
					conflict	F(1.148)=14.26	p<.05
					aggression	F(1,148)=16.23	p<.05
					quareiling	F(1,148)= 9.31	p<.05
					competition	F(1,148)= 7.04	p<.05
					rivalry	F(1,148)= 6.79	p<.05
					Prosocial		
					More prosocial wide spaced pairs:		
					Admiration	F(1,148)= 5.12	p<.05
					Nurturance	F(1,148)= 4.61	p<.05
					More prosocial in wide spaced dyads		
					Warmth	F(1,148)=9.79	p<.05
					Intimacy	F(1,148)=4.25	p<.05
					Prosocial	F(1,148)=4.84	p<.05
					Companionship	F(1,148)=24.04	p<.05
					Older sib		
					initiates more	F(1,148)=179.67	p<.05
					younger less	F(1,148)=5.63	p<.05
11) Minnett, Vandell & Santrock (1983)	target 7-8 sibs 4-12 divided		73 sib pairs	30 minute lab obs. divided into 3 segments	Imitation		
					No significance.		
					Dominance		
					Older more dominant.	F(1,71)=248.14	p<.0001

		into 16 groups (by sex, gap, birth order)			Older as teacher.	F(1,71)=31.06	p<.001
					Wide-spaced older more dominant.	p<.05 (Duncan)	
					Wide-spaced older as teacher.	p<.01 (Duncan)	
					Highest with same sex sib.	F(1,71)=7.27	p<.01
					Youngest more self-deprecation.	F(1,71)=8.47	p<.01
					Agonism		
					Higher agression with closely spaced sibling.	F(1,71)=4.17	p<.05
					Higher cheating with same sex sibling.	F(1,71)=7.95	p<.01
					Higher agression with same sex sibling.	F(1,71)=4.28	p<.05
					Higher negative behaviors with same sex sibling.	F(1,71)=9.60	p<.01
					Prosocial		
					Older more praise to younger.	F(1,71)=20.99	p<.001
					Wide-spaced more positive behavior	F(1,71)=8.27	p<.01
					Wide-spaced more affection.	F(1,71)=12.08	p<.001
					Wide-spaced firstborn more positive.	p<.05 (Duncan)	
					Girls give more praise to sibling.	F(1,71)=4.58	p<.05
					Boys more work/play with sibling.	F(1,71)=5.31	p<.05
					Sticks to task higher with same sex sibling.	F(1,71)=5.49	p<.05
12)Stewart (1983a)	sibs 30-58m. infants 10-20m.	13 m-m 19 f-m 10 m-f 12 f-f	54 mother-child pairs	Lab. obs. 38 minute strange situation	Prosocial		
					Older female gives more attachment behavior.	F(1,50)=37.61	p<.0001
					Female infants receive more attachment behaviors.	F(1,50)=26.34	p<.0001
					Mixed sex dyads show more attachment.	F(1,50)=52.86	p<.0001
13)Stewart (1983b)	sibs 36-59m 10-24m		56 dyads	45-minute lab visit	Imitation		
					Best predictor of infant behavior is sibling behavior	X2(9)=69.64	p<.0001

14)Brody, Stoneman & McKinnon (1982)	8-10 yrs. 4.5-7 yrs.	11 female 11 male dyads	22 same-sex pairs	3 30-minute home observations	Dominance		
					Presence of playmate meant older sibling directed teacher, manager, & playmate roles to sibling less often.	F(3,19)=21.65	p<.0001
					Older as teacher.	F(1,40)=12.29	p<.001
					Older as manager.	F(1,40)=8.87	p<.005
15)Dunn & Kendrick (1982)	older sibs 1.5-2yrs. at 2nd child's birth.	older 21 m. 19 f.	40 families	4 1-hr. obs., 1 before, 3 after baby's birth. Last when baby was 14 m.	Imitation		
					86% of older children occasionally or frequently imitated baby sibling.		
					89% of babies imitated older sibling.		
					Older child's imitation of newborn led to more positive relationship when infant was 14 m.	Mann-Whitney U U(40)=?	p<.01
					Child imitates baby more in same sex pairs than mixed sex.	U(40)=?	p<.01
					Baby imitates child more in same sex than mixed sex pairs.	U(40)=?	p<.10
					Agonism		
					Hostile behavior increases in mixed sex pairs from 8 to 14m.	U(40)=?	p<.05
					Prosocial		
					Same sex dyads increase in friendliness between 8 and 14 months.	U(40)=?	p<.05
16)Pepler, Abramovitch & Corter (1981)	range 36-76m.	28 pairs same sex, 28 pairs mixed sex	56 sib. pairs	Home observation	Imitation		
					Younger imitated more	F(1,24)=27.11	p<.01
					Over time, less imitation in mixed sex dyads.	F(1,24)=23.4	p<.01

					Time x sex x interval interaction.	F(1,24)=7.67	p<.05
					Agonism		
					Older sibs initiated more.	F(1,24)=30.84	p<.01
					Greater over time in mixed sex dyads.	F(1,24)=5.91	p<.05
					Prosocial		
					Older initiated more	F(1,24)=14.95	p<.01
					Marked increase over time for both older and younger.	F(1,24)=42.88	p<.01
17)Abramovitch, Corter & Pepler (1980)	younger X=20m.	36 mixed-sex pairs	36 dyads	2 1-hr. home observations	Imitation		
					Younger imitated more	F(1,32)=32.26	p<.01
					Dominance Response to agonism	Younger submit, older counterattack (no sig.)	
					Agonism		
					Older initiated more	F(1,32)=18.62	p<.01
					Prosocial		
					Older initiate more.	F(1,32)=14.35	p<.01
					Older girls more.	F(1,32)=4.81	p<.05
					Older responded positively to prosocial less often.	Mann-Whitney U =3.75	p<.01
18)Blank, Zuckerman, DePaulo & Rosenthal (1980)	between 9 & 15 y.	21 mf 16 mm	37 sib pairs	Nonverbal Discrepancy Test	Imitation		
					Same sex pairs showed more similarity on all 3 nonverbal indices whereas opposite sex pairs showed similarity only in discrepancy accuracy.	Decoding (r=.42 vs -.24) Discrepancy (r=.30 vs .55) Video Primacy (r=.35 vs. .07) p<.05	
19)Abramovitch Corter and Lando (1979)	Range 15-56m.	16 males 18 females	34 same-sex sib dyads	2 1-hr. home observations	Imitation		
					Younger imitated more.	F(1,30)=40.68	p<.01
					Dominance		
					Younger most likely to submit to aggression; older to counterattack.	43% submit vs. 16% counterattack 43% counterattack vs. 29% submit.	
					Agonism		
					Older children initiated the most agonism	F(1,30)=69.82	p<.01
					Boys more physical	F(1,30)=12.95	p<.01

					agression		
					Boys more verbal agression in small interval pairs; girls more verbal agression in large interval pairs.	F(1,30)=4.35	p<.10
					Prosocial		
					Older girls more prosocial.	F(1,30)=12.42	p<.01
					Females respond more positively to prosocial.	Mann Whitney U=30.75,	p<.01
20)Grotevant (1978)	teens average age 18.4yrs.	86 adopted males; 100 adopted females; 105 biological males; 134 biological females	425 adolescents	Given Strong-Campbell interest inventory	Imitation Girls with older sisters had less feminine interests	t(141)=2.45	p<.017
21)Lamb (1978)	18m. Infants & their preschool siblings	6 m-m 6 f-f 6 m-f 6 f-m	24 families	observed when infant was 12, 18 m. old	Imitation Younger monitors older	df estimated at (1,23) $\bar{X}$ per 8 minutes, 5.00	p<.0001
					Younger imitates older.	$\bar{X}$=.72	p<.0001
					Takes toys abandoned by older.	$\bar{X}$=1.09	p<.0001
					Imitation by younger increases over time		p<.0001
					Prosocial Girls directed more prosocial to sibs than boys did.		p<.03
					Boys touched sibling more often than girls did.		p<.02
22) Hodapp & LaVoie (1976)	5 to 7 years	24 m 24 f	48 second-borns	Experimental game-playing task	Imitation Second-born females in cross sex dyads more imitative than in same-sex dyads	t(5)=3.22, p<.05	
					Same comparison for males nonsignificant.	t(5)=1.30, p>.05	
23)Bigner (1974)	range 5.5-13.5	not specified	578 children	test of role	Dominance Older sib was	Since a+b=N, df=578 Median tests	

	years.			discrimination	assigned high power items, younger low power items.	p<.001
					Subjects with older male sibling assigned more power to older sibling than with older female sibling.	p<.05
					Wider spacing increased power ascription only by younger females with older brothers.	p<.01
					Cross-sex sibling ascribed more power by younger sibling.	p<.01
					Prosocial	
					Girls assign more facilitation items to female siblings and interference items to male siblings.	p<.01
24)Sutton-Smith & Rosenberg (1968)	5th & 6th grade	51 females 44 males	95 children	questionnaire	Dominance	
					Firstborns perceived as more bossy in male dyads,	Factorial analysis df=(1,95) p<.001
					female dyads,	p<.001
					and female-male dyads.	p<.05
					Agonism	
					Younger brother with older sister used agonism instead of powerlessness, uses more bribery and blackmail	p<.05
					breaking, taking things	p<.05
					Boys more likely to beat up, belt and chase	p<.01
					wrestle and chase	p<.05
					Girls scratch, pinch and tickle.	p<.02, p<.02 p<.05
					Younger males yell, shout, get angry more.	p<.05
					Prosocial	
					Firstborn girls ask, explain, take turns more.	p<.05

IMITATION
Table 1

Finding: The younger child is more likely to imitate the older child.

Study	Result	p	z	r
5	F(1,60)=4.34	.04	1.75	.226
11	F(1,71)=?	.50	0.00	.000
16	F(1,24)=27.11	.01	2.33	.476
17	F(1,32)=32.26	.01	2.33	.412
19	F(1,30)=40.68	.01	2.33	.425
21	F(1,23?)=?	.0001	3.72	.776
	F(1,23?)=?	.0001	3.72	.776
13	X2(9)=69.64	.0001	3.72	.497
7	F(11,22)=2.41	.05	1.64	.281
		$\bar{p}$=.0689	$\bar{z}$=2.39	$\bar{r}$=.430

Test of mean p:
$Z = (.50 - .0689)(\sqrt{12(9)}) = 4.48, p < .0001$

IMITATION
Table 2

Finding: Less imitation in mixed-sex dyads, or greater imitation in same-sex dyads.

10	F(1,148)=10.57	.05	1.64	.135
15	U(40?)=?	.01	2.33	.368
	U(40?)=?	.10	1.28	.202
16	F(1,24)=23.40	.01	2.33	.476
	F(1,24)=7.67	.05	1.64	.335
20	t(141?)=2.45	.983	-2.12	-.179
7	Lisrel	.05	1.64	.037
18	r=.42	.05	1.64	.270
	r=.30	.05	1.64	.270
	r=.35	.05	1.64	.270
22	t(5)=3.22	.95	-1.64	-.237
	t(5)=1.30	.50	0.00	.000
4	F(11,22)=2.55	.05	1.64	.281
		$\bar{p}$=.2233	$\bar{z}$=1.05	$\bar{r}$=.171

Test of mean p:
$Z = (.50 - .2233)(\sqrt{12(13)}) = 3.45, p < .0005$

DOMINANCE
Table 3

Finding: Older sibling as manager, younger as managee.

Study	Significance	p	Z	r
5	F(1,60)= 7.57	.008	2.41	.311
	F(1,60)=11.26	.001	3.09	.399
9	F(1,60)= 7.33	.01	2.32	.367
	F(3,26)= 6.73	.09	2.33	.457
14	F(1,40)= 8.87	.005	2.57	.406
4	F(11,22)=2.59	.10	1.28	.219
		$\bar{p}$=.0357	$\bar{Z}$=2.33	$\bar{r}$=.360

Test of mean p: $Z=(.50-.0357)(\sqrt{12(6)})=3.94$, $p<.0001$

DOMINANCE
Table 4

Finding: Older as teacher, younger as learner.

5	F(1,60)= 3.85[a]	.05	1.64	.212
	F(1,60)= 5.37a	.02	2.05	.265
9	F(1,40)= 6.23	.02	2.05	.324
	F(3,60)= 7.33b	.01	2.33	.557
14	F(1,40)= 12.29	.001	3.09	.489
11	F(1,71)= 31.06	.001	3.09	.367
		$\bar{p}$=.017	$\bar{Z}$=2.375	$\bar{r}$=.369

Test of mean p: $Z=(.50-.017)(\sqrt{12(6)})=4.098$, $p<.0001$

a School-aged females

b Females assume teaching role

DOMINANCE
Table 5

Finding: Older sibling more dominant, or perceived as such.

Study	Significance	p	z	r
10	F(1,148)=418.51	.05	1.64	.135
	F(1,148)=?	.05	1.64	.135
11	F(1,71)=248.14	.0001	3.72	.441
23	Mdn Test (578?)	.001	3.09	.128
24	F(1,95?)=?	.001	3.09	.317
	F(1,95?)=?	.001	3.09	.317
	F(1,95?)=?	.05	1.64	.164
1	F(1,40)=9.21	.01	2.33	.368
4	F(11.22)=2.59	.0001	3.72	.638
		$\bar{p}$=.018	$\bar{z}$=2.66	$\bar{r}$=.294

Test of mean p: $Z = (.50 - .018)(\sqrt{12(9)}) = 5.009$, $p < .0001$

AGONISM
Table 6

Finding: Older sibling initited more agonism.

16	F(1,24)=30.84	.01	2.33	.476
17	F(1,32)=18.62	.01	2.33	.412
9	F(1,30)=69.82	.01	2.33	.425
1	F(1,40)=16.21	.01	2.33	.368
4	F(11,22)=2.59	.05	1.64	.281
		$\bar{p}$=.017	$\bar{z}$=2.22	$\bar{r}$=.398

$p = (.50-.017)(\sqrt{12(6)}) = 4.098$. $p < .0001$

AGONISM
Table 7

Finding: Agonism is greater when siblings are closely spaced.

Study	Significance	p	z	r
10	F(1,148)=14.26 (Conflict)	.05	1.64	.135
	F(1,148)=16.23 (Aggression)	.05	1.64	.135
	F(1,148)= 9.31 (Quarelling)	.05	1.64	.135
	F(1,148)= 7.04 (Competition)	.05	1.64	.135
	F(1,148)= 6.79 (Rivalry)	.05	-1.64	-.135
11	F(1,71)= 4.17 (Agression)	.05	1.64	.195
		$\bar{p}$=.20	$\bar{z}$=1.09	$\bar{r}$=.10

Test of mean p: $Z=(.50-.20)(\sqrt{12(6)})=2.545$, $p<.0055$.

AGONISM
Table 8

Finding: Males display more agonistic behavior.

Study	Finding	p	z	r
5	F(1,60)=6.46	.01	2.33	.301
19	F(1,30)=12.95 (physical)	.01	2.33	.425
	F(1,30)=4.35a (verbal)	.10	1.28	.234
	F(1,30)=4.35b (verbal)	.90	-1.28	-.234
16	F(1,95)=?c	.05	1.64	.168
	F(1,95)=?	.01	2.33	.239
	F(1,95)=?	.05	1.64	.168
	F(1,95)=?	.98	-2.05	-.210
	F(1,95)=?	.98	-2.05	-.210
	F(1,95)=?	.05	1.64	.168
	F(1,95)=?	.05	1.64	.168
		$\bar{p}$=.29	$\bar{z}$=.859	$\bar{r}$=.111

Test of mean p: $(.50-.29)(\sqrt{12(11)})= 2.413$, $p<.008$

a small interval pairs

b girls in large interval pairs

c males in F-M pairs

AGONISM
Table 9

Finding: There is more agonism in same-sex dyads.

Study	Finding	p	Z	r
11	F(1,71)=7.95 (cheating)	.01	2.33	.276
	F(1,71)=4.28 (aggression)	.05	1.64	.195
	F(1,71)=9.60 (neg. beh.)	.01	2.33	.249
6	X (3)=9.95	.05	1.64	.205
1	F(2,29)=4.75	.05	1.64	.237
		$\bar{p}$=.034	$\bar{z}$=1.92	$\bar{r}$=.232

Test of mean p:
$$Z= (.50-.034)(\sqrt{12(5)})=3.61,\ p<.0005$$

PROSOCIAL
Table 10

Finding: Girls are more prosocial with their siblings.

Study	Significance	p	Z	r
5	F(1,60)=5.32	.02	2.05	.265
9	F(1,40)=3.75	.05	1.64	.259
11	F(1,71)=4.58	.05	1.64	.195
12	F(1,50)=37.61	.0001	3.72	.526
17	F(1,32)=4.81	.05	1.64	.290
19	F(1,30)=12.42	.01	2.33	.425
	U(30?)=30.75	.01	2.33	.425
21	F(1,23?)=?	.03	1.88	.392
24	F(1,95?)	.05	1.64	.168
23	Mdn (578?)=?	.01	2.33	.097
		$\bar{p}$=.027	$\bar{z}$=2.114	$\bar{r}$=.308

Test of mean p: $Z= (.50-.027)(\sqrt{12(10)} = 5.43,\ p=<.0001$

PROSOCIAL
Table 11

Finding: There is more prosocial behavior in widely spaced sibling pairs.

Study	Significance	p	Z	r
10	F(1,148)=5.12 (admiration)	.05	1.64	.135
	F(1,148)=4.61 (nurturance)	.05	1.64	.135
11	F(1,71)=8.27	.01	2.33	.276
	F(1,71)=12.08	.001	3.09	.367
3	F(1,58)=4.35	.01	2.33	.280
	F(9,50)=5.97	.001	3.09	.372
	F(9,50)=5.97	.001	3.09	.372
		$\bar{p}$=.017	$\bar{Z}$=2.46	$\bar{r}$=.277

Test of mean p: $Z=(.50-.017)(\sqrt{12(7)}) = 4.43$, p=.0001

PROSOCIAL
Table 12

Finding: More prosocial behavior occurs in same-sex dyads.

10	F(1,148)=9.79(warmth)	.05	1.64	.135
	F(1,148)=4.25(intimacy)	.05	1.64	.135
	F(1,148)=4.84(prosocial)	.05	1.64	.135
	F(1,148)=24.04(companions)	.05	1.64	.135
11	F(1,171)=5.31(work/play)	.05	1.64	.125
	F(1,171)=5.49(endurance)	.05	1.64	.125
12	F(1,50)=52.86(attachment)	.99	-3.72	-.526
15	U(40)=? (friendliness)	.05	1.64	.259
1	F(1,40)=5.21	.05	1.64	.237
		$\bar{p}$=.1544	$\bar{Z}$ =1.04	$\bar{r}$=.084

Test of mean p: $Z=(.50-.1544)(\sqrt{12\ (9)}) = 3.59$, p<.0005.

PROSOCIAL
Table 13

Finding: The older sibling initiated more prosocial behavior.

Study	Finding	p	Z	r
10	F(1,148)=179.67	.05	1.64	.135
	F(1,148)=5.63	.05	1.64	.135
16	F(1,24)=14.95	.01	2.33	.476
17	F(1,32)=14.35	.01	2.33	.412
5	F(1,60)=7.57	.008	2.41	.402
11	F(1,71)=20.99	.001	3.09	.362
2	t(47?)=?	.05	1.64	.250
1	F(1,40)=11.71	.001	3.09	.446
4	F(11,22)=2.59	.01	2.33	.399
		$\bar{p}$=.021	$\bar{Z}$=2.28	$\bar{r}$=.335

Test of mean p: $Z = (.50-.021)(\sqrt{12(9)}) = 4.98$, $p<.0001$